CEMEX:

Cement Manufacturer Saves 2.1 Million kWh Annually with a Motor Retrofit Project

Benefits

- Saves $168,000 in annual energy costs
- Reduces annual maintenance costs by $30,000
- Saves 2.1 million kWh annually
- Improves production
- Achieves an 8-month simple payback

Applications

Cement plants use motor-driven fans and pneumatic pumping systems to convey and transport cement. Properly selecting and configuring the motors in these systems is essential in reducing energy use and maintaining production reliability.

Summary

A motor system improvement project was completed at the CEMEX (formerly RMC Pacific Materials) cement plant in Davenport, California, in June 2004. The project retrofitted 13 worn motors on multiple cement blowers and silo pumps. Plant personnel evaluated the efficiency of the existing motors using DOE's MotorMaster+ software tool; this allowed them to determine that the existing units, which were inefficient and of the wrong type, required replacement. Because of this project, the plant is realizing annual energy and energy cost savings of more than 2 million kWh and $168,000, respectively, and annual maintenance cost savings of $30,000. In addition, the project has improved the plant's process control and increased throughput. A rebate from Pacific Gas & Electric Company (PG&E), CEMEX's electric utility, reduced total project costs to $134,000 for an 8-month simple payback.

Plant/Project Background

CEMEX was formed in 1906; it purchased the Davenport facility from RMC Pacific Materials in early 2005. The company is headquartered in Monterrey, Mexico, and operates in 50 countries, with 12 cement plants in the United States. Its products include ready-mix concrete, aggregates, asphalt, and industrial sands. Before the project, the plant experienced rising energy costs and motor shutdowns on the blowers and pumps that hindered production and increased maintenance costs.

Plant staff used MotorMaster+ to calculate the efficiency of the 13 motors, which had an aggregate horsepower of 2,350 hp. They found that all the motors were less than 80% efficient. All had been rewound at least once; some had been operating for 40 years. Many of the motors were open drip-proof units with ventilating openings in the motor casing to allow air to enter and cool the motor. However, these openings allowed cement dust to enter the motors, which blocked the air paths. This caused overheating and contributed to the shutdowns.

Plant personnel decided to retrofit the existing units with totally enclosed, fan-cooled (TEFC) motors of similar capacity. TEFC motors were selected because they do not allow air to move through the inside of the motor. Instead, the motors are cooled by an external fan that blows air across the outer surface of the motor to carry heat away, making them more suitable for dusty environments. Because the plant's fans and pumps operate at a constant load, no adjustable-speed drives were necessary.

Results

Retrofitting the motors on the blowers and pumping systems improved these systems' performance. Because cement dust no longer gets inside the motors, motor shutdowns have declined substantially. This has led to better throughput in the shipping area and increased output by 1,260 tons per month. In addition, the necessary torque start-up currents are now lower. This has eliminated voltage sag that used to occur upon start-up.

Because the newer motors have higher efficiencies (95%) than the ones they replaced, the blowers and cement pumps require less power to operate. Measurements of the motors' energy consumption show that the project has reduced energy use by 2,097,000 kWh and saves $168,000 in energy costs annually. These figures are consistent with the MotorMaster+ estimates. In addition, the plant is saving $30,000 in annual maintenance costs. A rebate from PG&E reduced the total project costs to $134,000, for a simple payback of 8 months.

Lesson Learned

The right type of energy-efficient motor can make a big difference in energy consumption and system performance. At CEMEX's Davenport plant, a group of motors that were beyond their useful lives operated inefficiently and were prone to shutdowns because they were not well suited to operate in dusty environments. This hampered production and increased energy and maintenance costs. By retrofitting these motors with more suitable units, the plant realized significant energy and maintenance cost savings and improved production.

The MotorMaster+ tool was invaluable in assessing the motors' efficiencies and determining the project's merit. MotorMaster+ and other DOE software tools—such as AIRMaster+, PSAT, SSAT, PHAST and FSAT—can all help manufacturing plants determine how to optimize their industrial equipment, systems, and processes.

Alan Simmons

Project Partners

CEMEX
Davenport, CA

Baldor Electric Company
Hayward, CA

Partner Profile

Alan Simmons is an electrical engineer in CEMEX's Electrical Maintenance Division, where he works to upgrade the efficiency of various process and motor systems. He routinely evaluates the efficiency of multiple processes at the Davenport plant and relies on DOE's MotorMaster+ software tool to gauge the efficiency of the site's motors. The Davenport plant has been using MotorMaster+ at the end-user level to evaluate motor efficiency since 2001.

Qualified Specialists

Industry professionals who are involved in system or plant operations, engineering, or management often use DOE software to evaluate their plants' motor and industrial systems. DOE offers one-day training workshops in compressed air, electric motor, fan, process heating, pump, and steam systems that teach the DOE assessment software tools (AIRMaster+, FSAT, MotorMaster+, PSAT, PHAST, SSAT, SSST and 3E Plus). These workshops assist the attendees in identifying cost-cutting and efficiency opportunities in their plants. DOE Qualified Specialists are also available to assist with system assessments.

BestPractices is part of the Industrial Technologies Program, and it supports the Industries of the Future strategy. This strategy helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together emerging technologies and energy-management best practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices emphasizes plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

For Additional Information, Please Contact:

EERE Information Center
1-877-EERE-INF
(1-877-337-3463)
www.eere.energy.gov

Visit our home page at
www.eere.energy.gov/industry

Industrial Technologies Program
Energy Efficiency and Renewable Energy
U.S. Department of Energy
Washington, DC 20585-0121

DOE/GO-102005-2145
November 2005